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DOCUMENT-IDENTIFIER: US 6386001 B1

TITLE: Optical fiber manufacture method including elongating a preform in a vertical direction and a horizontal direction

US PATENT NO. (1):
6386001Drawing Description Text (7):

FIG. 6 shows a first elongating device 402 that holds a standard rod 138 by a base material fix unit 136 to adjust the axis for elongating a glass base material 102.

Drawing Description Text (9):

FIG. 8 shows the first elongating device 402 that holds the standard rod 138 by the elongating chuck 142.

Drawing Description Text (10):

FIG. 9 shows the first elongating device 402, which holds the standard rod 138 by both of the hanging mechanism 134 and the elongating mechanism 140.

Detailed Description Text (13):

FIG. 6 shows a first elongating device 402 which holds a standard rod 138 by a material fix unit 136 to adjust the axis for elongating a glass base material 102. The hanging mechanism 134 has a mechanism not shown in the figure, that adjusts the vertical inclination of the base material fix unit 136. The elongating mechanism 140 has a mechanism, also not shown in the figure, that adjusts the vertical inclination of the elongating chuck 142. The elongating mechanism 140 further has a mechanism, again not shown in the figure, that adjusts the position of the elongating mechanism 140 within the horizontal phase in the directions back and forth and left and right.

Detailed Description Text (14):

FIG. 7 shows a detailed flow chart of a glass base material first elongating (S204) shown in FIG. 4. The glass base material first elongating (S204) has a process to adjust the elongating axis of the first elongating device 402. First, a metal or ceramic rod is prepared as a standard rod 138. The straightness of the standard rod 138 should be guaranteed. The standard rod 138 usually has a length of a glass base material 102 and dummy rod that is welded onto the glass base material 102. The straightness of the axis of the standard rod 138 is guaranteed along the full length.

Detailed Description Text (15):

As shown in FIG. 6, the standard rod 138 is held by the base material fix unit 136 of the hanging mechanism 134 (S110). Then, the inclination A of the hanging mechanism 134 is adjusted so that the direction of the standard rod 138 matches with the vertical direction (S112). Following this, the standard rod 138 is removed from the base material fix unit 136 after finishing the adjustment (S114).

Detailed Description Text (16):

FIG. 8 shows the first elongating device 402 that holds the standard rod 138 by the elongating chuck 142. The standard rod 138 is held by the elongating chuck 142 of the elongating mechanism 140 (FIG. 7, S116). Then the inclination B of the elongating mechanism 140 is adjusted so that the direction of the standard rod 138 matches with the vertical direction (FIG. 7, S118). At this time, it is desirable that the

elongating chuck 142 maintains the approximate center of longitudinal direction of the standard rod 138. The procedure for adjusting the hanging mechanism 134 and the elongating mechanism 140 can be reversible. The elongating mechanism 140 can be adjusted first, and then the hanging mechanism 134 can be adjusted.

Detailed Description Text (17):

FIG. 9 shows the first elongating device 402, which holds the standard rod 138 by both the hanging mechanism 134 and the elongating mechanism 140. After finishing the adjustment of the hanging mechanism 134 and the elongating mechanism 140, by holding the standard rod 138 by the base material fix unit 136, the lower end of the standard rod 138 is held by the elongating chuck 142 (FIG. 7, S120). Then, the horizontal direction position C of the elongating mechanism 140 or the horizontal direction position C of the hanging mechanism 134 is adjusted so that the difference in horizontal direction between the vertical axis and the standard rod 138 is less than 0.5 mm per 1 m length (FIG. 7, S122).

Detailed Description Text (19):

FIG. 10 and FIG. 11 show examples that use elongating rollers 144a and 144b on the elongating mechanism 140 instead of the elongating chuck 142. To adjust the vertical inclination of the axis connecting the hanging mechanism 134 and the elongating mechanism 140 in the case of using the elongating rollers 144a and 144b, the following method is adopted. The standard rod 138 is held by the elongating rollers 144a and 144b as opposed to the holding of the standard rod 138 by the elongating chuck 142 (FIG. 7, S116).

Detailed Description Text (20):

Following this, the inclination of the elongating mechanism 140 is adjusted by adjusting the horizontal inclination of the line F. The line F connects the two rotation axis between the elongating rollers 144a and 144b. After the adjustment of the inclination of the elongating mechanism 140 (FIG. 7, S118), the elongating rollers 144a and 144b can hold the standard rod 138 vertically.

Detailed Description Text (21):

Next, as shown in FIG. 11, the standard rod 138 is held by the base material fix unit 136 of the hanging mechanism 134 and the elongating rollers 144a and 144b of the elongating mechanism 140 at the step corresponding to holding the standard rod 138 by the base material fix unit 136 and the elongating chuck 142 (FIG. 7, S120). Then, the vertical inclination E of the axis which connects the hanging mechanism 134 and elongating mechanism 140 is adjusted. This adjustment is made either by adjusting the position of the elongating mechanism 140 in the horizontal direction or adjusting the position of the hanging mechanism 134 in the horizontal direction at the step corresponding to adjustment of the horizontal direction position of the hanging mechanism 134 and the elongating mechanism 140 (FIG. 7, S122).